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(54) FILE DISTRIBUTION METHOD AND CLIENT TERMINAL IMPLEMENTING THE SAME

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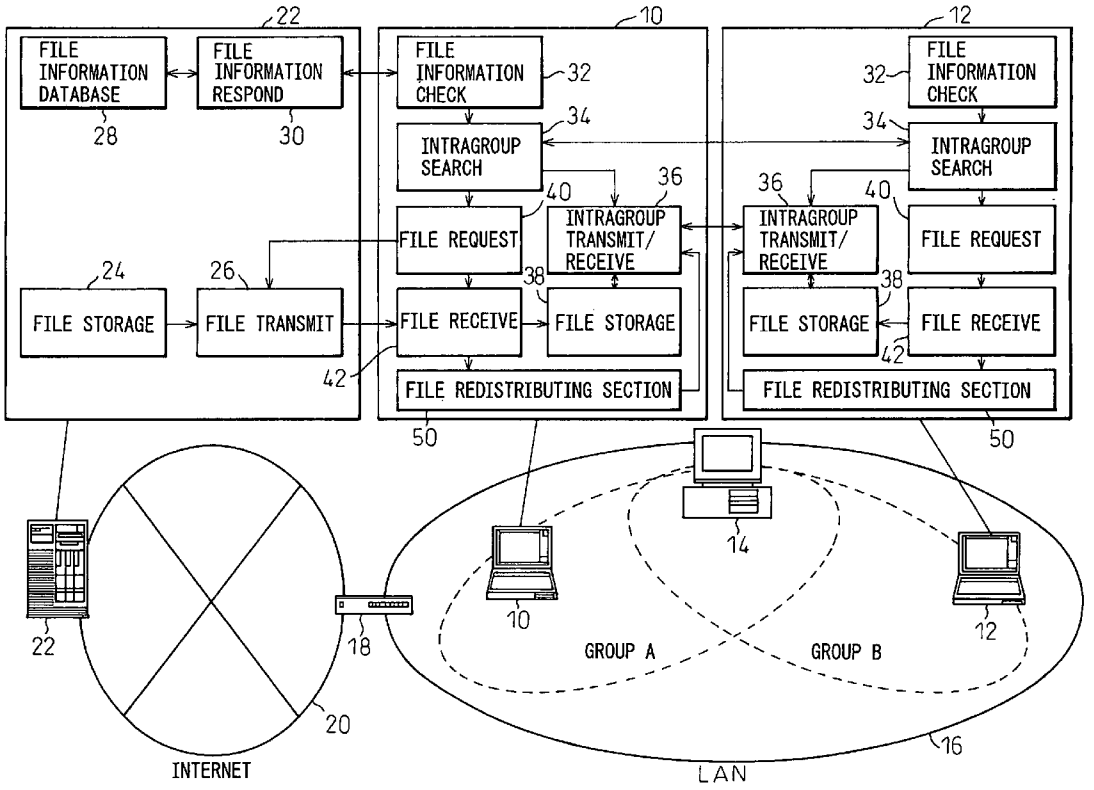
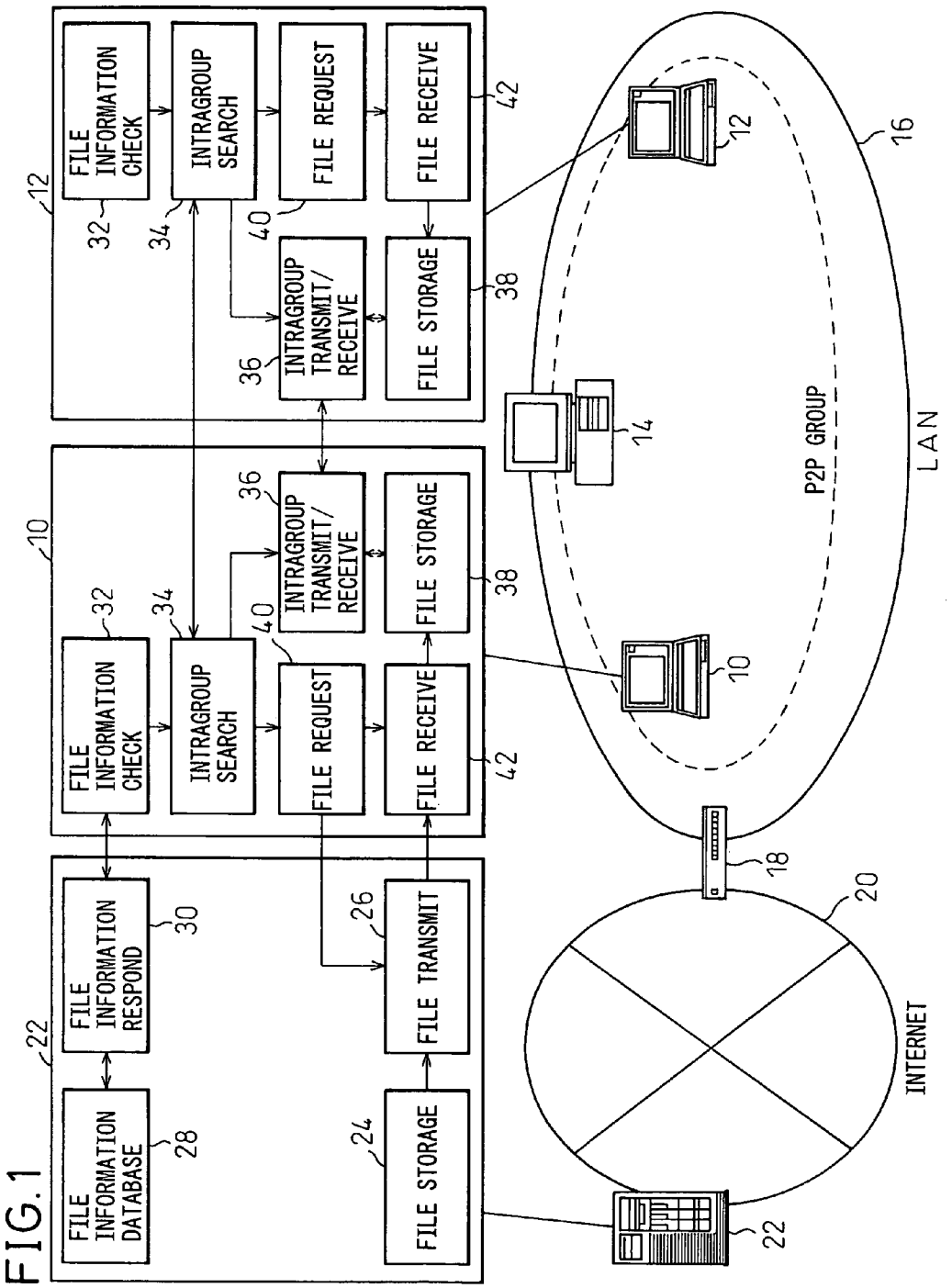
(57) **ABSTRACT**

A file distribution method is provided that is suitable for the transfer of files, such as patch files and virus definition files, to be released to an indefinite number of client terminals, and that can reduce the load concentration at a server without adding any extra hardware resources. A P2P group is constructed in advance between a plurality of client terminals. When a query is made from a client terminal to the server **22**, if any file needed is released at the server, first a search is conducted through the client terminals in the P2P group for a client terminal holding that file. If a hit is found as a result of the search, the file is acquired from that client terminal. If no hit is found, then the file is acquired from the server.




FILE INFORMATION DATABASE
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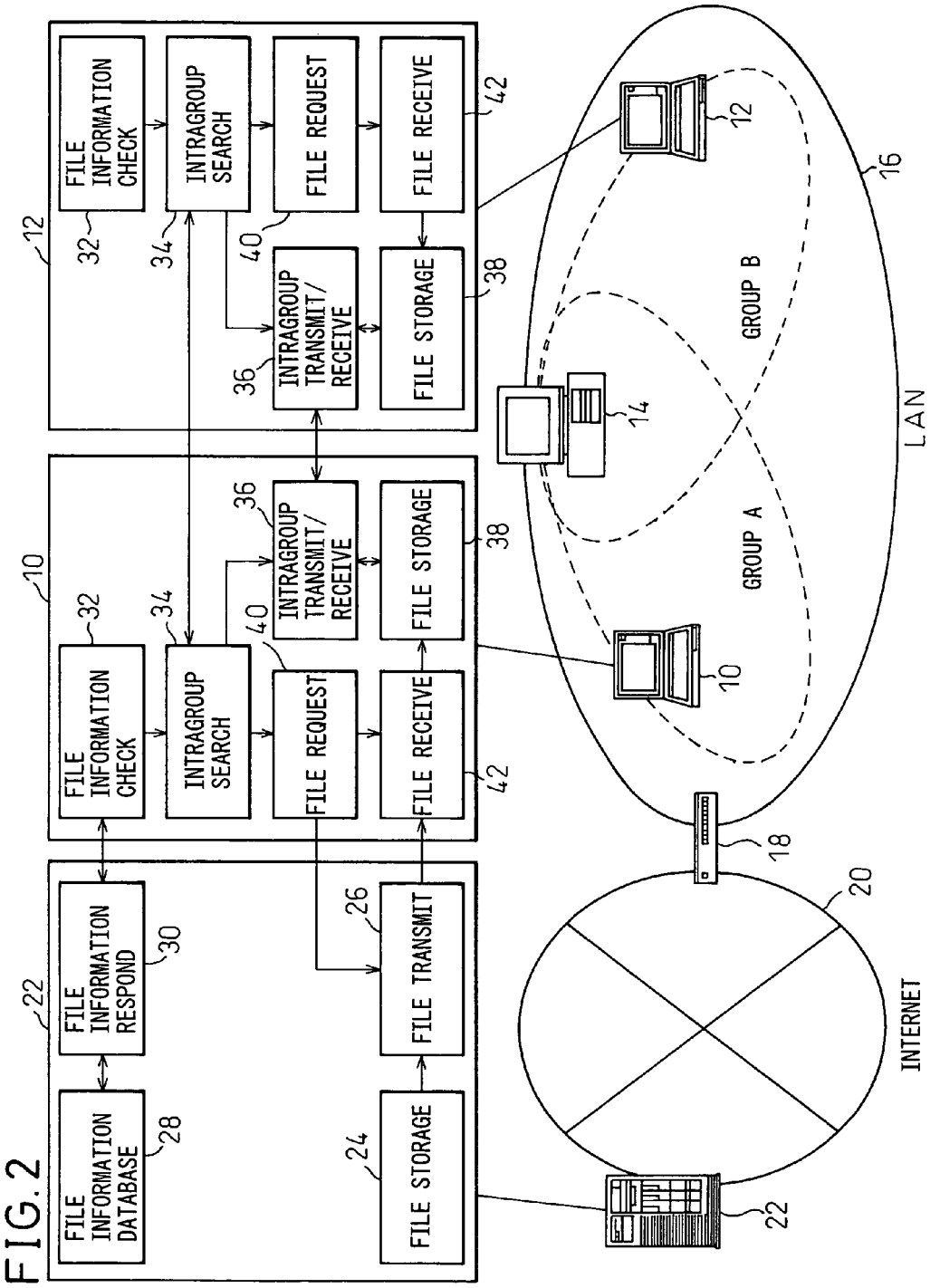
FILE INFORMATION RESPOND
30
22
FILE STORAGE
24
FILE TRANSMIT
26
FILE INFORMATION CHECK
32
INTRAGROUP SEARCH
34
FILE REQUEST
40
INTRAGROUP TRANSMIT/ RECEIVE
36
FILE STORAGE
38
FILE RECEIVE
42
10
12
INTERNET
20
18
LAN
16
P2P GROUP
14

FIG. 1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FILE REQUEST
40
INTRAGROUP TRANSMIT/ RECEIVE
36
FILE STORAGE
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FILE RECEIVE
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INTERNET
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LAN
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GROUP A
GROUP B
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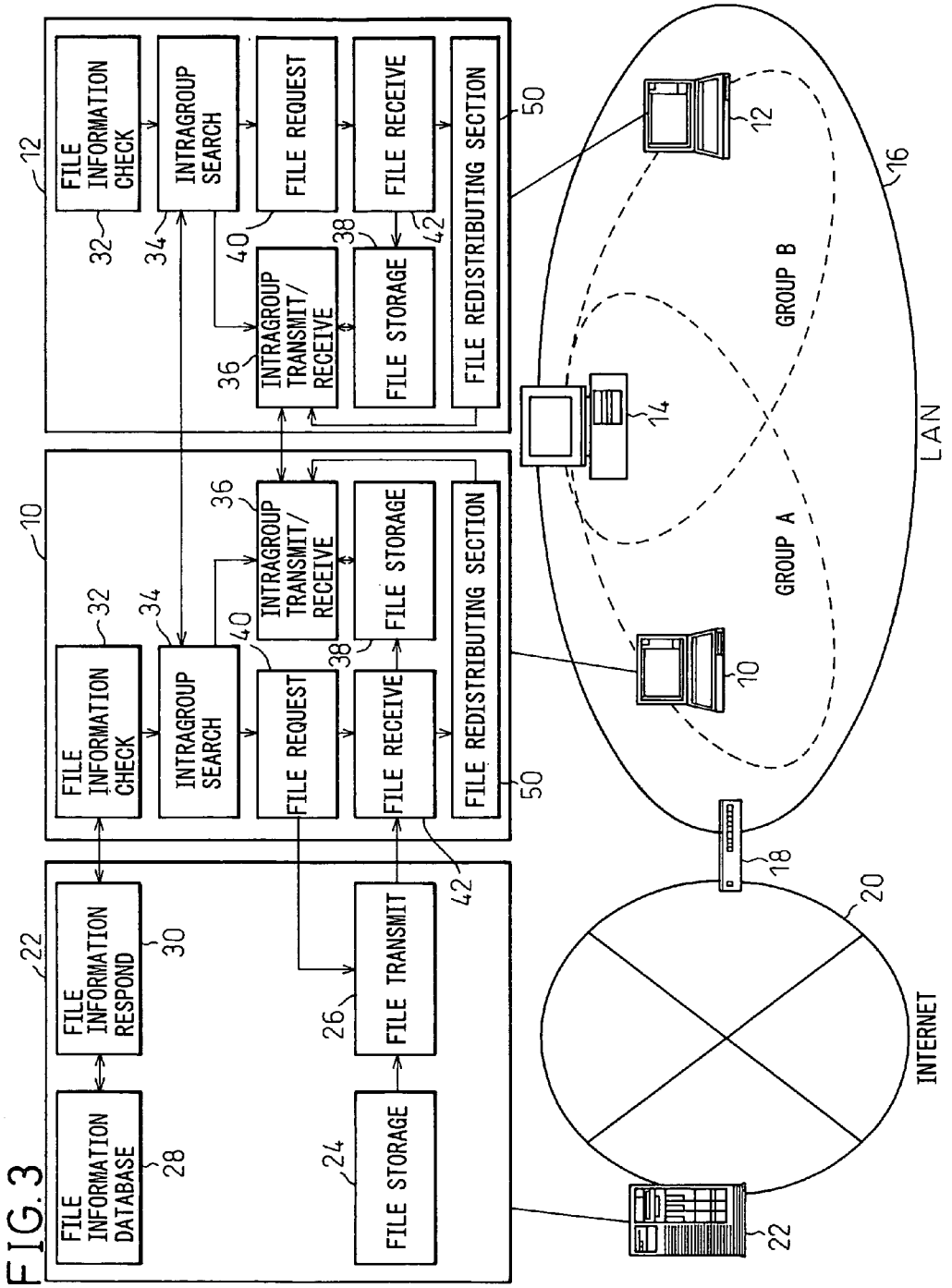
FIG. 2


12
FILE INFORMATION CHECK
INTRAGROUP SEARCH
FILE REQUEST
FILE RECEIVE
FILE REDISTRIBUTING SECTION
32
34
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INTRAGROUP TRANSMIT/ RECEIVE
FILE STORAGE
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FILE INFORMATION CHECK
INTRAGROUP SEARCH
FILE REQUEST
FILE RECEIVE
FILE REDISTRIBUTING SECTION
INTRAGROUP TRANSMIT/ RECEIVE
FILE STORAGE
22
FILE INFORMATION RESPOND
FILE INFORMATION DATABASE
FILE TRANSMIT
FILE STORAGE
30
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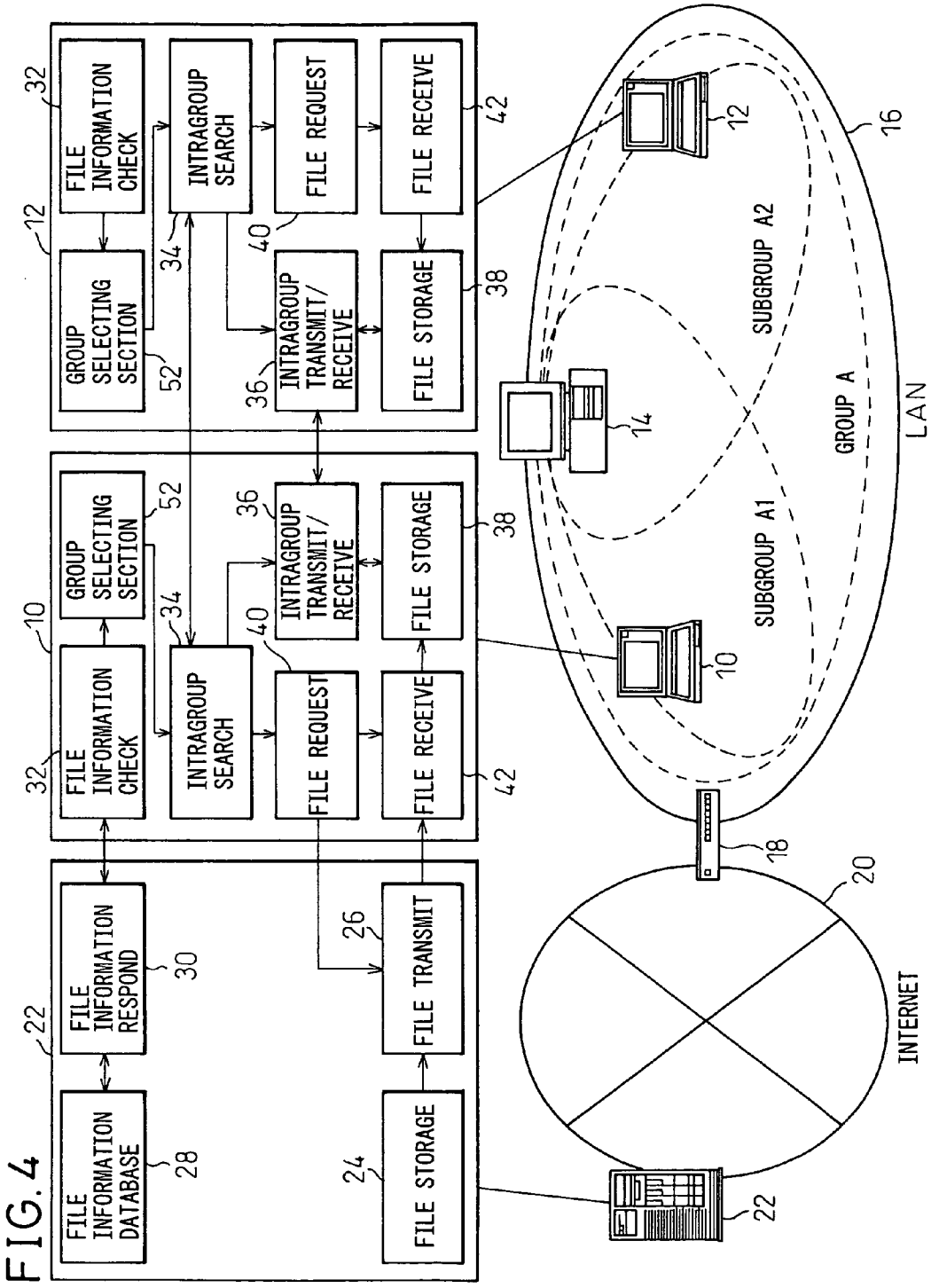
26
24
GROUP A
GROUP B
LAN
INTERNET
16
18
20

FIG. 3


FILE INFORMATION DATABASE
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FILE INFORMATION RESPOND
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FILE STORAGE
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FILE TRANSMIT
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FILE INFORMATION CHECK
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GROUP SELECTING SECTION
52
INTRAGROUP SEARCH
34
FILE REQUEST
40
INTRAGROUP TRANSMIT/ RECEIVE
36
FILE STORAGE
38
FILE RECEIVE
42
10
12
INTERNET
20
18
LAN
16
GROUP A
SUBGROUP A1
SUBGROUP A2
10
12
14
22

FIG. 4

FILE DISTRIBUTION METHOD AND CLIENT TERMINAL IMPLEMENTING THE SAME

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a method for distributing a file from a server to many client terminals over a network, for example, for online updating purposes, and a client terminal implementing the same.

[0003] 2. Description of the Related Art

[0004] From the Web sites of operating system software vendors and browser or other client software vendors, security patches are released periodically, or when the need arises, in order to fix any security holes found after shipment of the software. Further, from the Web sites of anti-virus software vendors, the latest virus definition files are released periodically, or when the need arises, in order to counter newly-found viruses. Users access designated sites manually or automatically to check whether any patch files or the latest virus definition files have been released, and install such files by manually or automatically downloading them. Therefore, immediately after the release of a new patch file or virus definition file, there arises the problem that the server of the file is overloaded with accesses and the server response speed drops.

[0005] If the capacity of the file distribution server is to be increased or a mirror site is to be installed in order to alleviate the access overload problem, an extra cost, for the necessary equipment, will occur at the vendor side. Furthermore, even if the capacity is increased, there arises the same problem if accesses exceeding the increased capacity occur.

[0006] Another possible solution is to install, between the file distribution server and the client terminals, a cache server that many client terminals can use in common, but this solution is not viable in cases where the validity and up-to-dateness of a file is guaranteed by direct communications between the server and the client terminals and the intervention of a cache server is therefore not permitted. This solution has the further problem that an extra hardware resource, i.e., the cache server, has to be installed.

[0007] Japanese Unexamined Patent Publication No. 2003-308268 proposes that, first, the content be forcibly delivered to a predesignated first terminal within a user network and, when a request for the delivery of the content is received from a second terminal in the user network, the content be delivered from the first terminal instead of the server, thereby attempting to reduce the load of the server. If this technique is to be applied to the distribution of a file such as a patch file or a virus definition file to an indefinite number of client terminals, the client terminal that should first receive the file in the user network must be predetermined, and this must be managed at the vendor side, which is not realistic.

[0008] P2P technology, such as Gnutella and WinMX, allows file sharing among many client terminals by transferring files between client terminals in a P2P (peer to peer) fashion, eliminating the need to install a specific file server. If this P2P technology is to be applied directly to the distribution of a file such as a patch file or a virus definition file, the server at the vendor side has to be incorporated into this P2P group, which is also not realistic.

SUMMARY OF THE INVENTION

[0009] Accordingly, it is an object of the present invention to provide a file transfer method suitable for the transfer of files to be released to an indefinite number of client terminals, and also provide a client terminal implementing the same.

[0010] According to the present invention, there is provided a file distribution method of distributing a file to a plurality of client terminals, comprising: constructing in advance a P2P group that comprises at least some of the plurality of client terminals; sending a request from a first client terminal belonging to the P2P group to a server for the transfer of information concerning files held within the server; when any file indicated in the information transferred from the server is needed, then searching through the client terminals belonging to the P2P group for a second client terminal holding the file;

[0011] when a hit is found as a result of the search, then sending a request from the first client terminal to the second client terminal for the transfer of the file; and

[0012] when no hit is found as a result of the search, then sending a request from the first client terminal to the server for the transfer of the file.

[0013] In the above configuration, only the client terminal that has first attempted to acquire the file in the P2P group accesses the server and downloads the file, and thereafter, the file is transferred within the P2P group; in this way, the load concentration at the server can be alleviated without having to add any extra hardware resources.

[0014] Preferably, constructing the P2P group in advance includes constructing a plurality of P2P groups each comprising a plurality of client terminals, the information transferred from the server further includes information concerning the P2P group corresponding to the file, and the search is conducted through the client terminals belonging to the P2P group corresponding to the file determined as being needed.

[0015] In this way, the search range is restricted to a specific group of client terminals, so that the load of the client terminals to be searched can be distributed over the client terminals.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] **FIG. 1** is a block diagram of a file transfer system according to a first embodiment of the present invention;

[0017] **FIG. 2** is a block diagram of a file transfer system according to a second embodiment of the present invention;

[0018] **FIG. 3** is a block diagram of a file transfer system according to a third embodiment of the present invention; and

[0019] **FIG. 4** is a block diagram of a file transfer system according to a fourth embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] **FIG. 1** shows the configuration of a file distribution system according to one embodiment of the present invention.

[0021] In **FIG. 1**, a local area network **16** comprising client networks **10**, **12**, and **14** is connected to the Internet **20** via a relay device **18**. A server **22** for patch file distribution is also connected to the Internet **20**. A P2P group is formed between the terminals **10**, **12**, and **14** by using P2P software that runs on the respective terminals. Firewall software is running on the relay device **18**. This firewall is configured to prevent the packets for implementing the functions of the P2P group from flowing out of the LAN **16** into the Internet **20**. That is, the P2P group is closed within the LAN **16** and does not extend beyond the relay device **18**.

[0022] The server **22** comprises: a file transmitting section **26** which transmits a file to a requesting terminal via the Internet **20** by retrieving the file from a file storage section **24** in which patch files are stored; a file information database **28** which stores file information concerning the files stored in the file storage section **24**; and a file information responding section **30** which transmits the file information in response to a request from a terminal. The file transmitting section **26**, the file information database **28**, and the file information responding section **30** are all implemented in software that runs on the server **22**.

[0023] The client terminals **10**, **12**, and **14** each comprise: a file information checking section **32** which queries the server **22** for the file information and checks if any file that needs to be applied is released at the server **22**; an intragroup searching section **34** which, when any such file is available at the server **22**, searches the P2P group for that file by transferring an inquiry between the client terminals, in accordance with P2P technology, to find if any other client terminal holds that file; an intragroup transmitting/receiving section **36** which, when any terminal holding that file is found, performs a peer-to-peer file transfer between the terminals and stores the file in a file storage section **38**; a file requesting section **40** which, when it is found as a result of the intragroup searching that there is no terminal within the group that holds the file, then makes a request to the server **22** to transfer the file; and a file receiving section **42** which receives the file transferred in response to the request and stores the file in the file storage section **38**. The file information checking section **32**, the intragroup searching section **34**, the intragroup transmitting/receiving section **36**, the file requesting section **40**, and the file receiving section **42** are all implemented in software that runs on the client terminal.

[0024] In the above configuration, when any of the client terminals **10**, **12**, and **14**, by querying the server **22** manually or automatically by software, knows that a file such as a new patch file or virus definition file has been released, and when the client terminal decides to acquire the file for installation, first the P2P group is searched to find if any other terminal within the same group holds that file and, if any terminal holding that file is found, a request is made to that terminal for the transfer of the file; on the other hand, if there is no terminal holding that file, the request is sent to the server **22**. In this way, as only the terminal that first knows about the release of the file in the P2P group sends a file transfer request to the server **22**, the load of the server can be reduced without having to add any extra hardware resources.

[0025] **FIG. 2** shows the configuration of a file transfer system according to a second embodiment of the present invention. In **FIG. 2**, it is assumed that the terminals **10** and **12** are notebook-type client terminals having a poor CPU resource, while the client terminal **14** is a desktop terminal having a relatively good CPU resource. A group A as a first P2P group is formed between the terminals **10** and **14**, and a group B as a second P2P group is formed between the terminals **12** and **14**. The file information database **28** in the server **22** stores the file information in the format shown in Table 1 below.

TABLE 1

Example of file information

URGENCY LEVEL	FILE NAME	P2P GROUP NAME
A	A1	GROUP A
A	A2	GROUP A
B	B1	GROUP B

[0026] In Table 1, a file with the file name A1 and a file with the file name A2 are the files for the group A, while a file with the file name B1 is the file for the group B. In this example, the group A corresponds to urgency level A, and the group B corresponds to urgency level B.

[0027] Known P2P technology, such as WinMX (Version 2.6), that can define a plurality of P2P groups can be used here. With this P2P technology, group ID can be specified, and this ID can also be used as the P2P group name. If the P2P technology used here is one that has provision for the installation of a parent server, the address of the parent server may be used as the P2P group name, or the P2P group name may be defined so as to indicate the file name extension (characters appended at the end of the file name).

[0028] In the example shown in **FIG. 2**, the file sharing group A is constructed of the terminals **10** and **14**, and the file sharing group B is constructed of the terminals **12** and **14**, by using the above P2P technology. Any terminal newly activated during system operation will participate in either one of these groups in accordance with the mechanism of the P2P technology used.

[0029] The way of grouping the terminals is manually set by the administrator of each terminal based, for example, on an instruction from the administrator of the LAN. Further, the administrator makes a judgment and issues an instruction by considering, for example, machine power, length of machine running time (all night or not), physical network configuration, etc. Based on these criteria, the terminals are grouped in such a manner that the terminals judged to be the terminals to which a patch should be applied earlier than the other terminals belong to the group of the higher urgency level and the other terminals belong to the group of the lower urgency level. The above judgment, instruction, and setting may actually be implemented automatically by software.

[0030] In the above network and system, file A2 may be newly posted at the server **22** as a patch file of urgency level A (see Table 1). Then, the terminal **14** sends a query to the server **22** from its file information checking section **32** earlier than the other terminals in the LAN **16**. The file information checking section **32** holds the name of the previously applied patch file as shown in Table 2 below in the same format as the file information database of Table 1.

TABLE 2

Example of file information held in file information checking section

URGENCY LEVEL	FILE NAME	P2P GROUP NAME
A	A1	GROUP A

[0031] The server **22** that received the query refers to the file information database **28**, and responds to the query by transmitting to the terminal **14** the patch file name and the P2P group name corresponding to the type of the patch. The type here refers to the patch urgency level, and the contents of Table 1 are transmitted in their entirety as the response.

[0032] Based on the above response, the terminal **14** determines the patch file to be applied to itself. Here, it is assumed that, of the patch files not yet applied to itself, the terminal **14** desires to have those of urgency level A applied and decides that the patch file with the file name A be applied. In this situation, the intragroup searching section **34** in the terminal **14** conducts a search for that file within the group (group A) corresponding to the reported P2P group name. As, in this case, the result of the search shows no hits, the file requesting section **40** in the terminal **14** makes a request to the server **22** for the transfer of the file; in the server **22**, the file transmitting section **26** retrieves the requested file from the file storage section **24** and transmits it to the requesting terminal **14**. In the terminal **14**, the file receiving section **42** receives the file and stores it in the file storage section **38**.

[0033] The terminal **10** may send a query to the server **22** for the file information. It is also possible that the terminal **10**, like the terminal **14**, holds the information shown in Table 2. The server **22** that received the query responds by sending the contents of Table 1. Based on this response, the terminal **10** decides that the patch file with the file name A2 must be applied. Then, the intragroup searching section **34** in the terminal **10** conducts a search for that file within the group (group A) corresponding to the reported P2P group name. As, in this case, the result of the search shows a hit, the intragroup transmitting/receiving section **36** in the terminal **10** receives the patch file A2 from the thus found terminal **14** and stores the file in the file storage section **38**.

[0034] In the above process, as the terminal **10** downloads the patch file A2 from the terminal **14**, the access load on the server **22** can be reduced. Furthermore, as the search range is restricted to the group A in the LAN, it becomes possible to construct a system that provides a faster response for patch file distribution than the prior art system can.

[0035] Moreover, in the present embodiment, the P2P group is not constructed only from the poor CPU resource terminals **10** and **12**, but each group is constructed by including a good CPU resource terminal **14**, and this terminal **14** requests the server **22** for the delivery of the patch earlier than any other terminal does; this serves to reduce the load of each terminal as well as the load of the network by preventing extra traffic from flowing.

[0036] In the above description, each group has been set according to the urgency level of the patch file, but instead of using the urgency level as the criterion, each group may be set according to whether the software to which the patch is to be applied, such as the operating system or application program, is already installed or not.

[0037] Further, instead of reporting the group name for every file released at the server **22**, the group name may be reported only for files larger than a predetermined size, and the file transfer according to the method of the present invention may be performed only for such files, with provisions made so that each terminal downloads any file smaller than that size directly from the server **22**.

[0038] The file information stored in the file information database **28** within the server **22**, and to be returned to the client terminal in response to the query received from the file information checking section **32** in the client terminal, may include file attribute information such as file size, time stamp, and a checksum, in addition to the file name and group name shown in Table 1. Table 3 below shows an example of the information that carries the checksum of each file (the value of the sum of data contained in the file) as the file attribute information.

TABLE 3

Second example of file information

URGENCY LEVEL	FILE NAME	P2P GROUP NAME	CHECKSUM
A	A1	GROUP A	chk_a1
A	A2	GROUP A	chk_a2
B	B1	GROUP B	chk_b1

[0039] When the file is acquired from the server **22** or from another client terminal, the checksum value calculated from the data contained in the file is compared with the checksum carried in the file information returned from the server **22** and, if they do not match, the file is discarded by determining that an error has occurred; this makes it possible to address the situation that the file is corrupted for such reasons as communication trouble or alterations made at another terminal.

[0040] **FIG. 3** shows a file transfer system according to a third embodiment of the present invention. The difference from the system of **FIG. 2** is that each of the client terminals **10**, **12**, and **14** includes a file redistribution section **50**. The file redistribution section **50** distributes the file downloaded from the server **22**, to another client terminal within the same group in accordance with Winny technology which is a P2P technology. The thus redistributed file is further redistributed to another client terminal within the same group in accordance with the Winny technology. Then, at each client terminal, when its intragroup searching section **34** has conducted a search for the file within the group, if it is found that the target file is already stored within its own terminal, then the client terminal uses that file stored within itself. If the target patch file is not stored within itself, the client terminal recognizes that the file stored in another terminal is the target file, and receives the patch file from that other terminal and stores it within itself. Here, the result of the intragroup searching does not always show the result of searching only within its own terminal. That is, the redistribution of the file within the P2P group, after downloading it from the server **22**, may not be performed for a long time and, before the redistribution is completed, the

result of the intragroup searching may show the result of searching within its own terminal or within another terminal.

[0041] Further, the intragroup searching section **34** may perform the intragroup searching in such a manner that first its own terminal is searched for the target patch file and, if it is not found within it, then other terminals are searched for the file.

[0042] Furthermore, rather than redistributing the file to all the terminals within the group after downloading it from the server, a query may be sent to each of the other terminals to see if it desires to receive the file by way of redistribution, and the file may be redistributed only to the terminals that desire to receive the file. In this case, each terminal that received the query about the redistribution responds by determining whether it desires to receive the file or not, for example, based on the CPU resource usage at that instant in time.

[0043] With the above provision, compared with the case of redistributing the file to all the other terminals, a time difference can be introduced when redistributing the file within the P2P group, and also the file redistribution can be preformed considering the load condition of each terminal; therefore, the system can alleviate the load of each terminal as well as the load concentration in the network.

[0044] **FIG. 4** shows a file transfer system according to a fourth embodiment of the present invention. The differences from the system of **FIG. 2** are that a plurality of subgroups are formed between the client terminals forming each P2P group, and that each client terminal includes a group selecting section **52** for selecting one of the plurality of subgroups. In the example shown in **FIG. 4**, subgroups A1 and A2 are formed within the group A which is one of the P2P groups. When the group name of the file, reported from the server **22** in response to the query from the file information checking section **32**, is group A, then the group selecting section **52** selects one of the subgroups A1 and A2, for example, in a round robin fashion, and the intragroup searching section **34** searches the client terminals within the selected subgroup for the file. As the search range is thus restricted to a specific group of client terminals, the load of the client terminals to be searched does not concentrate on a specific terminal but can be distributed over the client terminals.

1. A file distribution method for distributing a file to a plurality of client terminals, comprising:

constructing in advance a P2P group that comprises at least some of said plurality of client terminals;

sending a request from a first client terminal belonging to said P2P group to a server for the transfer of information concerning files held within said server;

searching through the client terminals belonging to said P2P group for a second client terminal holding said file when any file indicated in said information transferred from said server is needed;

sending a request from said first client terminal to said second client terminal for the transfer of said file when a hit is found as a result of said search; and

sending a request from said first client terminal to said server for the transfer of said file when no hit is found as a result of said search.

2. A file distribution method according to claim 1, wherein constructing said P2P group in advance includes constructing a plurality of P2P groups each comprising a plurality of client terminals,

said information transferred from said server further includes information concerning the P2P group corresponding to said file, and

said search is conducted through the client terminals belonging to said P2P group corresponding to said file determined as being needed.

3. A file distribution method according to claim 2, wherein said plurality of P2P groups are constructed according to the degree of urgency with which the client terminals need said file.

4. A file distribution method according to claim 2, wherein said plurality of P2P groups are constructed according to the presence or absence of software to which said file is to be applied.

5. A file distribution method according to claim 1, wherein said information transferred from said server includes attribute information concerning said file, and

a value indicating the validity of said file acquired by said first client terminal is examined based on said attribute information.

6. A file distribution method according to claim 1, further comprising redistributing said file transferred from said server to said first client terminal, to another client terminal within said P2P group.

7. A file distribution method according to claim 6, further comprising sending a query from said first client terminal to the other client terminals in said P2P group as to whether said other client terminals desire to receive said file by way of redistribution, and wherein

said file is redistributed only to the client terminals that desire to receive said file.

8. A file distribution method according to claim 1, wherein said P2P group contains a plurality of P2P subgroups,

said method further comprises selecting one of said plurality of P2P subgroups, and

said search is conducted only through the client terminals belonging to said selected P2P subgroup.

9. A client terminal comprising:

means for constructing a P2P group with other client terminals;

means for requesting a server for the transfer of information concerning files held within said server;

means for searching through the client terminals belonging to said P2P group for a client terminal holding a file that is indicated in said information transferred from said server and that is determined as being needed;

means for acquiring said file from the client terminal found to hold said file as a result of said search; and

means for acquiring said file from said server when no hit is found as a result of said search.

10. A client terminal according to claim 9, wherein said P2P group constructing means is capable of constructing a plurality of P2P groups,

said information transferred from said server further includes information concerning the P2P group corresponding to said file, and

said searching means searches through the client terminals belonging to said P2P group corresponding to said file determined as being needed.

11. A client terminal according to claim 10, wherein said plurality of P2P groups are constructed according to the degree of urgency with which the client terminals need said file.

12. A client terminal according to claim 10, wherein said plurality of P2P groups are constructed according to the presence or absence of software to which said file is to be applied.

13. A client terminal according to claim 9, wherein said information transferred from said server includes attribute information concerning said file, and

said client terminal further comprises means for examining, based on said attribute information, a value indicating the validity of said file acquired from said server or from said client terminal found to hold said file.

14. A client terminal according to claim 9, further comprising means for redistributing said file acquired from said server to another client terminal within said P2P group.

15. A client terminal according to claim 14, further comprising means for sending a query to the other client terminals in said P2P group as to whether said other client terminals desire to receive said file by way of redistribution, and wherein

said redistributing means redistributes said file only to the client terminals that desire to receive said file.

16. A client terminal according to claim 9, wherein said P2P group contains a plurality of P2P subgroups,

said client terminal further comprises means for selecting one of said plurality of P2P subgroups, and

said searching means conducts said search only through the client terminals belonging to said selected P2P subgroup.

17. A program storage device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform method steps for distributing a file to a plurality of client terminals, said method steps comprising:

constructing in advance a P2P group that comprises at least some of said plurality of client terminals;

sending a request from a first client terminal belonging to said P2P group to a server for the transfer of information concerning files held within said server;

when any file indicated in said information transferred from said server is needed, then searching through the client terminals belonging to said P2P group for a second client terminal holding said file;

when a hit is found as a result of said search, then sending a request from said first client terminal to said second client terminal for the transfer of said file; and

when no hit is found as a result of said search, then sending a request from said first client terminal to said server for the transfer of said file.

18. A program storage device according to claim 17, wherein constructing said P2P group in advance includes constructing a plurality of P2P groups each comprising a plurality of client terminals,

said information transferred from said server further includes information concerning the P2P group corresponding to said file, and

said search is conducted, through the client terminals belonging to said P2P group, corresponding to said file determined as being needed.

19. A program storage device according to claim 18, wherein said plurality of P2P groups are constructed according to the degree of urgency with which the client terminals need said file.

20. A program storage device according to claim 18, wherein said plurality of P2P groups are constructed according to the presence or absence of software to which said file is to be applied.

21. A program storage device according to claim 17, wherein said information transferred from said server includes attribute information concerning said file, and

a value indicating the validity of said file acquired by said first client terminal is examined based on said attribute information.

22. A program storage device according to claim 17, further comprising redistributing said file transferred from said server to said first client terminal, to another client terminal within said P2P group.

23. A program storage device according to claim 22, further comprising sending a query from said first client terminal to the other client terminals in said P2P group as to whether said other client terminals desire to receive said file by way of redistribution, and wherein

said file is redistributed only to the client terminals that desire to receive said file.

24. A program storage device according to claim 17, wherein said P2P group contains a plurality of P2P subgroups,

said method steps further comprise selecting one of said plurality of P2P subgroups, and

said search is conducted only through the client terminals belonging to said selected P2P subgroup.

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